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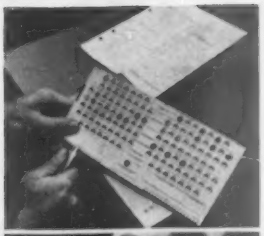
SCIENCE NEWS LETTER

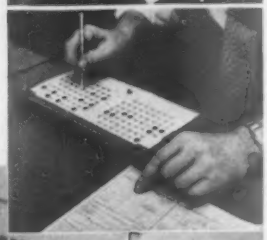
THE WEEKLY SUMMARY OF CURRENT SCIENCE

STS Winners
See Page 132

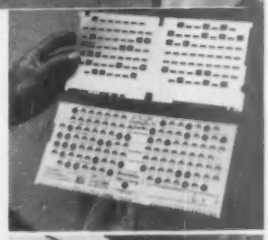
A SCIENCE SERVICE PUBLICATION

How your telephone call asks directions... and gets quick answers





Perforated steel cards, which give directions to the Long Distance dial telephone system, are easy to keep up to date. New information is clipped (1) and punched (2) by hand on a cardboard template. This guides the punch-press that perforates a steel card (3), and the two are checked (4). The new card is put into service in the card translator (5).



When the Bell System's latest dial equipment receives orders to connect your telephone with another in a distant city, it must find—quickly and automatically—the best route.

Route information is supplied in code—as holes punched on steel cards. When a call comes in, the dial system selects the appropriate card, then reads it by means of light beams and phototransistors. Should the preferred route be in use the system looks up an alternate route.

It is a simple matter to keep thousands of cards up to date when new switching points are added or routing patterns are changed to improve service. New cards are quickly and easily punched with the latest information to replace out-of-date cards.

This efficient, flexible way of keeping your dial system up to the minute was devised by switching engineers of Bell Telephone Laboratories, who are continually searching for ways to improve service and to lower costs. Right now most of the Long Distance dialing is done by operators, but research is hastening the day when you will be able to dial directly to other telephones all over the nation.

BELL TELEPHONE LABORATORIES

Improving telephone service for America provides careers for creative men in scientific and technical fields.

PUBLIC SAFETY

New Dangers of H-Bomb

Victims of H-blast may face different but just as lethal radioactive products as persons near an A-bomb explosion. AEC warns about fall-out of fission products.

➤ DIFFERENT BUT just as dangerous fusion products may endanger H-bomb victims who escape the fission products of the old-fashioned A-bomb explosion.

Speculation about whether hydrogen bombs have fall-out of less dangerous radioactive dust than uranium or plutonium bombs is whetted by a special report of the Atomic Energy Commission on the Effects of High-Yield Nuclear Explosions.

Fission products are atoms of chemical elements newly formed, during the explosion, out of the fragments of uranium and plutonium atoms. Atoms of uranium and plutonium are among the heaviest that exist. Atoms of fission products are in the middle range of atomic weight among the chemical elements.

The fusion reaction, which makes the H-bomb possible, occurs in a different way. It explodes by releasing as energy excess mass that comes from combination of the lightest elements.

Hydrogen, which occurs in three weights, is the lightest of all the elements. But nuclear fusion reactions are known to be possible among several other elements that are slightly heavier. Besides hydrogen, these are helium, lithium and beryllium.

Beryllium is the villain element in this quartet. It is one of the poisonous elements, a group made up of arsenic, osmium, and a few others, including, as it happens, uranium and plutonium. These are chemical poisons, acting on the kidneys and throwing the body's waste-disposal system out of gear.

Deadly Bonus

This poisonous property is common to all forms of the elements mentioned. It has nothing to do with any fissionable or fusionable properties of any of their isotopes. Nuclear explosions are just a deadly bonus that can be achieved with a few of them.

But if beryllium is formed by fusion combinations among the light elements, its presence in fall-out dust from H-bomb explosions will be potentially dangerous to people in the contaminated area. If such beryllium should form in quantity and occur as a strongly radioactive isotope of medium long life, it might be as deadly as certain of the dangerous fission products.

Two fission products of uranium and plutonium are stressed in the Atomic Energy Commission's recent report. These are the radioactive forms of the elements iodine and strontium. They are not as violent poisons as beryllium and arsenic, but both are elements which the body takes up and stores for long periods of time.

Iodine is taken up particularly by the thyroid gland. Strontium is a near chemical relative of calcium. It can replace that common element in the bones. Both of these elements in their radioactive forms give off a high level of radiation.

Such radiation is given off by elements which are disintegrating radioactively. They always tend to destroy tissues, although some do this at a rate that is slow compared to the body's ability to repair itself.

The curative power of such rays in the case of cancer comes only from their power to kill cancer cells, thus helping the body fight the cancer and try to repair the damage it has done.

Disintegrate Quickly

Elements which have a high level of radioactivity are disintegrating fast. Some accomplish this so fast that all their radiations are given off within hours, minutes, or even fractions of a second after the triggering reaction that brought them into being.

Although these may be very "hot" during their lifetimes, they are not feared as much as those of medium length of life.

At the other extreme, radioactive isotopes with very long lives are apt to be mild in their effects on living matter. Carbon 14, for example, which requires nearly 6,000 years to lose half its radioactivity, is considered one of the less dangerous of the radioactive elements.

The fact that it is constantly present in living plants and animals has recently been utilized to date ancient materials which contain carbon.

The rate at which the radiation from the carbon in the material is given off can be interpreted to tell the date that carbon exchange in life processes ceased.

Damaging radiations which take many years to decay to a safe level may shorten human life. Radiations which stay at a dangerous level for the length of a generation or two may so damage the germ cells by which life is continued from parent to child that the existence of our species may be endangered.

The path of radioactive decay is always from heavier to lighter isotopes. The fission process hastens this decay by splitting the heaviest elements, which are the only ones subject to this process, into elements of medium weight.

Radioiodine and radiostrontium are products of the fission process. They come from uranium and plutonium. They are too heavy, so far as we can tell at the present time, to be products of the opposite fusion process which builds up the lightest elements into others nearly as light.

Since the dreaded fission products come from A-bomb material which is present, we are led to believe, in only small amounts in H-bombs, if at all, it might be argued that the fall-out problem is less serious with H-bombs, except for their greater size.

The fact is known that trouble from A-bomb fall-out is less when the bomb is dropped from a plane and exploded high in the air than when a comparable bomb is hung on a tower.

In that case bits of the vaporized tower mix with the dust of the desert which the explosion kicks up. Newly formed fission products settle on these relatively large grains of dust and are carried to earth by gravity. They arrive much sooner than the wind-borne molecules of radioactive materials let loose in the upper air when the bomb is dropped with a device to explode it high.

But H-bombs, because they are so much bigger, will strew their products wider over the countryside. These products will presumably contain fewer atoms of fission products. If they contain, instead, beryllium as a fusion product to ride the dust particles instead of iodine and strontium, the situation is much the same.

Poisons will still be broadcast, taking potential toll of generations yet unborn.

Science News Letter, March 5, 1955

PALOMAR'S "HORSESHOE"—This plastic replica of the two principal bearings that support the 200-inch telescope on Mt. Palomar is shown by Howard N. Kaufman, research engineer for Westinghouse Electric Corporation, which developed the system. A film of oil, three-thousandths of an inch thick, reduces the friction to the point where the huge 500-ton telescope can be moved with a ½-horsepower motor that is only slightly larger than the motor in a washing machine.

GEOPHYSICS

See New Radio Channel

"Whistlers," audible radio waves produced by lightning, may some day be used for long-distance communication. Signals can be picked up from storms in opposite hemisphere.

➤ INVISIBLE TUBES of force in the earth's atmosphere may some day be used for long-distance communications, it is foreseen from reports that scientists have launched intensive studies of "whistlers," which are audible radio waves.

An antenna hooked to an amplifier is sufficient equipment to tune in on these semi-musical sounds, produced by lightning flashes. The whistlers heard at any point have traveled along the earth's magnetic force lines from the opposite hemisphere, Dr. L. R. O. Storey of England's Radar Research Establishment in Malvern, suggests.

In doing so, they reach a height above the equator that is equal to the diameter of the earth itself, or nearly 8,000 miles. Short whistlers are believed to result from lightning flashes occurring at the end of a line of magnetic force in the opposite hemisphere.

Long whistlers are thought to originate in local lightning storms, the sound energy traveling along the tube of force to the opposite hemisphere, then being reflected back after reaching the earth at the other end.

Whistlers sound like a whistle falling steadily in pitch. They are first heard at about ten kilocycles per second, then fade within one to four seconds to about one kilocycle per second. The human ear hears in the range from about two cycles per second to 20 kilocycles per second.

To use the earth's magnetic lines of force for communication between the Northern and Southern Hemispheres would require generating energy in this range equal to that kicked up by lightning flashes. Much more study of the whistlers will be needed before this is feasible.

For this reason, scientists aboard the U.S.S. Atka, Navy ice-breaker returning from the Antarctic, are keeping track of whistlers. Daily messages were received from the Atka giving information on the whistlers heard on its trip to the white continent.

These messages are also being sent on its return trip.

Both the Central Radio Propagation Laboratory of the National Bureau of Standards at Boulder, Colo., and radio experts at Stanford University in California, under the leadership of Dr. Robert Helliwell, are setting up programs for keeping track of these strange sounds. They are interested in the time and duration of the whistlers, the number that occur during a given period, and how the hour and season affect their occurrence.

A recent scanning of the atmosphere near the earth's magnetic equator, from Achimota in Africa's Gold Coast, detected no whistlers there. This finding, reported by Dr. Storey and Dr. J. R. Koster of the University College of the Gold Coast, supports the theory that the queer sounds follow the earth's magnetic lines of force.

Over the equator, these lines are horizontal and the whistlers, therefore, would be unable to travel up through the lower ionosphere to reach the lines of force.

That whistlers have traveled to such great distances from the earth is expected to change present ideas about the earth's outermost atmospheric layers.

Science News Letter, March 5, 1955

AGRICULTURE

Sell Eggs by Machine Down by the Farm

➤ VENDING MACHINES may soon offer individual farmers an opportunity to market fresh eggs at increased profits, David Dunwiddie, a Whitewater, Wis., poultry expert, believes.

"The small farmer is prevented from bottling milk or processing many of his farm products," he explains. "But any farmer could market eggs if he desired. In eggs, you have the finished product right in your hands. If the product is of good quality, it will sell."

The cost of vending machines would be high, but a group of farmers could pool their resources to buy such machines and install them in places where they would attract the attention of customers.

Science News Letter, March 5, 1955

PHYSIOLOGY

People More "Grasping" Than They Need Be

➤ PEOPLE ARE more "grasping" than they need to be.

This has been demonstrated in research by John Lyman of the engineering department at the University of California at Los Angeles.

Most persons use much more grasp force than necessary in picking up objects, and workers who wear gloves expend considerably more energy on such tasks than those without gloves.

Subjects were asked to pick up a cylinder, whose weight could be varied by inserting different loads, from a base hole and place it in designated holes at various distances. The holes were in a half-circle panel which corresponded to the individual working area of a work bench or assembly line. A highly sensitive device in the cylinder measured the grasp force.

It was found that subjects always used more force than needed in picking up an object initially. In repeated performances the force was relaxed somewhat. There was a difference of a half pound force used in picking up objects close to the body and those at arm's length.

Gloves, even thin rubber surgical ones, made a difference in force used. Subjects used an average 3½-pound grip force with heavy gloves to pick up a one-pound object, 2¼ pounds with surgical gloves and a two-pound force with bare hands.

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TECHNOLOGY

Russia Stresses Aid

The Near and Far East have become the prime targets for the Communists' technological assistance and aid propaganda, which was increased substantially in 1954.

➤ RUSSIA'S TECHNOLOGICAL and economic propaganda warfare against the West was greatly intensified during 1954, Dr. D. A. Fitzgerald, deputy director for operations of the U. S. Foreign Operations Administration, told SCIENCE SERVICE.

The Soviet "bloc" increased their offers of economic and technological assistance to many nations throughout the world, but particularly to the underdeveloped countries of the Near, Middle and Far East, Dr. Fitzgerald said.

Commenting on what could be expected in 1955, the foreign operations expert stated that "it is possible that there will be a new party line, but prior to the change in the Russian government I would have expected that the Soviet Union would follow through with intensifying their technological propaganda warfare.

"I believe," Dr. Fitzgerald said, "that the step-up of Soviet action in this field is proof of the effectiveness of the United States and United Nations programs of technical cooperation and economic assistance with the underdeveloped areas.

"Our deeds have so undermined the empty promises of their propaganda that they are now forced into making offers of action," he stated.

Economic and technological warfare during 1954 was mostly in the form of more offers of capital assistance and technical manpower assistance, as well as an increase in the number of fairs and trade agreements entered into by the Soviet Union and its satellites.

During 1954 the Soviet bloc offered capital assistance to five nations. They offered to build a cement plant in Iceland, a sugar refinery in Indonesia, a steel plant in India, and grain storage facilities, farm milling facilities and paving of the streets of Kabul in Afghanistan. They also offered capital assistance to a South American country.

India, it is reported, has accepted in principle the offer for the construction of a steel plant, and Afghanistan has had some grain storage facilities constructed under this set-up. But, the other nations, as far as known, have not accepted capital assistance.

Offers to supply technicians, engineers and scientists, Dr. Fitzgerald said, were made to about 16 countries. There seems to be no clear cut pattern as to what type of assistance is offered. It is offered by the Russians mostly on a basis of covering any or all fields.

It is significant that all but two of the 16 technical offers were made to the countries in the area known as the "arc," which stretches from Iran in the Near East to Japan and Indonesia in the Far East. This area comprising 840,000,000 people has become the prime target for Russia's technological propaganda machine.

The trade fairs in which the Soviet bloc participated in 1952 numbered only 25. In 1954, however, their participation almost doubled and they took part in 46 fairs.

In addition to the fairs and offers of assistance, the Soviet bloc successfully concluded 29 trade agreements in 1954 with nations in Europe, Asia, Africa and South America.

Just how much in dollars Russia has subsidized its technological propaganda machine is not known.

The United States is expected to spend approximately $130,000,000 in providing technical assistance throughout the free world during the current fiscal year. More than half of this money, $70,000,000, will be used in the same Near and Far East area in which the Soviets are concentrating their efforts.

The change in area emphasis away from Europe and towards the underdeveloped areas of the Near and Far East has been occurring gradually over the past few years. This area is expected to become more of a focal point for increased United States technical aid in the future.

At the same time, the United States is jumping into the trade fair department. In 1954, American industrial exhibits were officially represented in only one fair, at Bangkok, Thailand. This year, under a new program of participation in international fairs being set up by the Department of Commerce, the United States will be represented in at least 25 fairs throughout the world.

Science News Letter, March 5, 1955

BIOLOGY

Chemical for Eternal Growth Is Isolated

➤ PURE CRYSTALS of a chemical which makes cells divide and which, theoretically, could be changed to stop cancer are announced by scientists in the botany and biochemistry departments of the University of Wisconsin.

The crystals seem to be an eternal growth chemical. When added to culture media for plant cells that are long past the growing period, the cells divide and new cells continue to be formed indefinitely. The first signs of growth usually show up within three to five days.

For this rejuvenated growth to be continuous, the cells must also have the plant hormone, auxin, which makes the cells elongate.

The eternal growth chemical which makes the cells divide has been named kinetin, pronounced kine-uh-tin. Once its chemical structure has been worked out, the scientists hope to create a slightly altered kinetin that will block the natural kinetin in rapidly dividing cells such as cancers. This might lead to a chemical for stopping cancers.

Kinetin was discovered accidentally when the scientists used a four-year-old bottle of DNA in some work on yeast extracts. DNA is desoxyribonucleic acid, found in the nucleus of cells.

The molecular weight of kinetin is 215 and the molecule contains 10 atoms of carbon, nine of hydrogen, five of nitrogen and one of oxygen.

It was discovered by Carlos Miller, Prof. Folke Skoog, Malcolm von Saltza and Prof. F. M. Strong with the support of the American Cancer Society, the Wisconsin Alumni Research Foundation and the National Science Foundation.

Science News Letter, March 5, 1955

• RADIO

Saturday, March 12, 1955, 5:00-5:15 P.M. EST

"Adventures in Science," with Watson Davis, director of Science Service, over the CBS Radio Network. Check your local CBS station.

Mr. Donald Mason, technical director of the Freeport Sulphur Company, New York, will discuss "Sulphur."

GROWTH CHEMICAL — Yields of pure crystalline kinetin, a complex compound that causes cell division and growth, are displayed by University of Wisconsin scientists who produced the substance. Seated are (left to right) Profs. Folke Skoog and F. M. Strong. Malcolm von Saltza and Carlos Miller stand behind them.

PSYCHIATRY

Need Music Therapists

➤ THERE ARE more positions for trained music therapists in America's hospitals today than there are qualified persons to fill them.

Dr. Roy L. Underwood, director of fine arts and head of the music department at Michigan State College, first university department in the United States to offer the music therapy degree, reports continued success of music therapy in medicine and psychiatry. High standards demanded of the therapist, and, in some cases, starting salaries that are lower than are offered in other professions, contribute to the shortage.

While a number of general hospitals today are employing musicians, mental hospitals remain the major employer. "With more than 600 neuro-psychiatric institutions in the United States, it will be many years before the saturation point is reached," Dr. Underwood predicted.

The successful therapist is frequently one who has faced the problem of choosing between a musical career, teaching, or a career as a nurse or doctor. The music therapist is able to combine these ambitions most successfully in one profession.

Music, Dr. Underwood emphasized, is not a cure in itself. But it can provide enjoyment, self-expression, an outlet for the emotions and a feeling of accomplishment. It is especially helpful, too, in treatment for those with inferiority problems.

In some cases of the physically handicapped, playing a musical instrument can help to develop stricken muscles and a sense of rhythm.

"The music therapist actually is a kind of musical pharmacist," Dr. Underwood said. "The psychiatrist, physician or psychologist prescribes, while the therapist prepares 'ingredients' called for in a particular case. Music is part of the therapeutic team and part of the total treatment."

Music and the playing of musical instruments have been used effectively with the deaf and blind, those afflicted with cerebral palsy, poliomyelitis, cardiac difficulties, orthopedic handicaps, or speech disorders, and with pre-psychotic children.

Music also is being used effectively in hospitals for orthopedic and tuberculosis patients, during local and spinal anesthesia, and preceding general anesthesia.

Since the four-year course was introduced at Michigan State in 1944, approximately 20 students have graduated and are now on duty in hospitals over the country. Seventeen are enrolled in the curriculum today.

The therapist's academic training includes the study of music, psychology, sociology and physical education. When the course work is completed, the student must spend six months' internship in a neuro-psychiatric hospital before the degree is granted. Starting salaries for the graduate therapist range at present between $3,500 and $4,000.

Personal qualifications for students include high scholastic standing, musicianship and sound musical training, excellent health and emotional stability. In addition to individual work with patients, the music therapist must be able to organize different types of music groups, play the piano by ear, perform music for different religious services and even repair broken musical instruments.

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GEOLOGY

Volcano's Rumbles Alarm New Zealanders

➤ MT. NGAURUHOE, 7,515 feet high in the center of New Zealand's north island, has been rumbling so loudly that faraway residents thought the noise was coming from an extinct volcano 80 miles away.

Mt. Ngauruhoe has been very active for many years, but residents near the extinct volcano Mt. Egmont, 8,260 feet high, became alarmed by the noise of subterranean rumblings and decided the mountain had come to life after six centuries of slumber.

Geologists and geophysicists have now reported that the rumblings were the noise of explosive outbursts in Ngauruhoe.

They believe the sounds were carried into the upper atmosphere and then refracted downwards in sufficient strength to be heard near Egmont, where they rattled windows and shook street lamps.

Similar noises were reported at the coastal city of Wanganui, also about 80 miles from Ngauruhoe.

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MEDICINE

New Child Disease: Bobby Pin in Kidney

➤ EXISTENCE OF a new ailment of small children is reported by Dr. Duncan Macauley of the University of Manchester and Dr. Thomas Moore, consultant surgeon to the Duchess of York Hospital for Babies in Manchester, England.

Bobby pin in the kidney might be the name for the new ailment, though the Manchester doctors do not give it a specific name.

They discovered its existence when a three-year-old boy was admitted to the hospital with symptoms of what seemed to be acute kidney disease. This diagnosis seemed especially likely as the little boy had been ailing for about a month with enlarged neck glands and discharging left ear.

X-ray pictures showed a foreign body in the abdomen close to the first part of the small intestines and also close to the kidney.

The doctors operated and found the bobby pin passing from the intestine to the upper part of the kidney through a short passage it apparently had made between the two organs. The bobby pin was removed and the child recovered.

The parents, interviewed after the X-rays showed a foreign body, remembered that about four months before the little boy had "announced one day that he had swallowed a hair-grip." Hair-grips and kirbigrips are known in America as bobby pins.

When told he would have to go to the doctor, the child promptly denied having swallowed anything and as he seemed well for the next few days, the matter was forgotten.

In their report to the *British Medical Journal* (Jan. 22), the doctors state this is the fifth case on record of a child having swallowed a bobby pin which perforated the intestine and lodged in the kidney. In all the cases, there were no signs at first. Then later, kidney symptoms developed.

Toddlers are so prone to put things in their mouths that the Manchester doctors advise fellow physicians to suspect a swallowed foreign body in children of this age who have symptoms that are not easy to diagnose.

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METEOROLOGY

Russians Build Stations On Drifting Ice Floes

➤ THE RUSSIANS have established two weather stations on drifting ice floes in the central Arctic.

Known as North Pole-3 and North Pole-4, the Russians claim that for the first time these stations make it possible to analyze the Arctic weather and substantiate weather forecasts for the entire Soviet Union.

Describing life on the ice floes, the Reds state that there are two types of dwellings, prefabricated cottages on skids and tents. The tents "are made of many layers of fabrics stitched together with warm interlinings" and capable of providing warmth even when the temperature outside drops to 40 degrees below zero Fahrenheit.

"The stations have helicopters, tractors and cross country motorcars at their disposal," they report, as well as "gas heating, electric light, radio and even telephone communications."

Communication with the island's personnel, described as "outstanding scientists and experienced polar explorers who have spent more than one winter in the Arctic," is maintained by radio and aircraft.

Although there was no mention of when the drifting islands were manned, nor how big they are, the Russians stated that the "wintering" parties were landed by polar planes together with the tons of material and technical equipment.

The report of the establishment of the two ice island weather stations was made in *Voks* (Nov. 12, 1954), the bulletin of the U.S.S.R. Society for Cultural Relations with Foreign Countries.

Science News Letter, March 5, 1955

Thirty-five million families in the U. S. own at least one *automobile*.

MILITARY PHONE—One of the new portable telephone systems that can handle four conversations at a time over a single cable is demonstrated in action. The repeater shown here is used to amplify the conversations, which may be transmitted over a distance of a hundred miles. Another, twelve-channel system, also developed by Bell Telephone Laboratories, can handle three times as many conversations over a single cable as comparable units used in World War II and Korea.

ASTRONOMY

Solve Venus Mystery

➤ A MYSTERY of the solar system, how the planet Venus points in spinning, has been solved.

Dr. Gerard P. Kuiper, an astronomer at the University of Chicago's Yerkes Observatory at Williams Bay, Wis. and McDonald Observatory, Mount Locke, Tex., has discovered that the pole of rotation of Venus is tipped at an angle of 32 degrees to its path in the heavens, compared with the earth's 23.5 degrees.

A day on Venus, one rotation upon its axis, is not almost a year of earthly time as some textbooks estimate, but probably not more than a few weeks, Dr. Kuiper's observations indicate.

The rapid rotation is shown, he believes, by the alternating dark and light bands with which the planet is covered. Changes take place in these bands from day to day. They are sometimes quite irregular. The bands, usually three bright ones and three dark ones, are thought to be parallel to the equator of Venus.

Existence of the alternating bands indicates the planet's rapid rotation. Dr. Kuiper believes the dark bands are regions where there is much yellow dust. The bright bands show areas where there is less dust and where overlying carbon dioxide in the atmosphere scatters more of the sun's ultraviolet radiation.

This, Dr. Kuiper said, explains why the bands are visible in ultraviolet light but not at longer wavelengths, such as visible light.

Predicting weather on Venus "should be much simpler" than on earth, he stated. If there were no oceans on earth and no water vapor in the atmosphere, then our weather might be like that on Venus. That planet seems to have an ideal atmospheric circulation pattern, with three zones of ascending air currents and four zones of descending currents, including those over the polar caps.

On Venus, the ascending currents, laden with dust, photograph dark, the descending ones bright.

Dr. Kuiper made his observations of Venus with the 82-inch telescope at McDonald Observatory, operated jointly by the Universities of Texas and Chicago. Even though he could see no decided changes in the alternating bands during four-hour observing periods, when he brought 65 photographs together, he was able to detect the changes that take place from day to day.

He pinned down where Venus points in spinning by comparing drawings made from the photographs with a white globe marked with circles, moving the globe until its circles agreed best with the bands shown on the drawings.

The axis of Venus points to a position in the sky having a right ascension of three hours 32 minutes and a declination of plus 81 degrees. This is in the constellation of Cepheus.

The plane of the orbit of Venus around the sun is inclined only about three degrees to the plane of the earth's orbit, Dr. Kuiper reported in the *Astrophysical Journal* (Nov.)

Science News Letter, March 5, 1955

ELECTRONICS

12 Conversations on Military Phone System

➤ THE ARMY now has a portable telephone system that can carry 12 simultaneous conversations.

Its terminal units are about the size of large suit cases and they can be stationed up to 200 miles apart. Several such systems could be linked to span one-third the distance across the United States.

The conversations are carried on different frequencies in a cable that could be laid on the ground, buried, or strung on poles.

A second unit is also now available that could carry four conversations for 100 miles. They were developed by Bell Telephone Laboratories for the U. S. Army Corps of Engineers.

Miniaturized parts are credited with reducing the weight of the equipment. The new four-channel unit weighs only 178 pounds and occupies five and a half cubic feet. An earlier system with the same capacity weighed 475 pounds and occupied 20 cubic feet.

Both units can be used in conjunction with a radio relay system.

The equipment was designed to withstand desert heat, arctic cold and 100% humidity. It also passed vibration and shock tests.

Science News Letter, March 5, 1955

ENGINEERING

Study Fish Habits In Designing Dam

➤ ENGINEERS WHO designed the McNary Dam spanning the Columbia River had to study fish psychology to plan the fish ladders.

Finny migrants are stubborn and reluctant to retreat from a position even though conditions make it difficult for them to go on. They appear to move along the shore line or at the edge of speedy currents rather than in the main stream, Harry L. Drake, George C. Richardson, H. M. Rigler, and R. A. Schuknecht of the U. S. Corps of Engineers reported.

Taking this into consideration, fish entrances were designed on each side of the spillway and at the Oregon shore fish ladder, they told a meeting of the American Society of Civil Engineers.

Science News Letter, March 5, 1955

PHYSIOLOGY

College Athletes Weigh More at Middle Age

➤ VARSITY LETTER athletes are more likely to pick up excess poundage than non-athletic classmates.

Dr. Wayne W. Massey, associate professor of physical education at the University of California at Los Angeles, based this conclusion on an extensive survey of graduates who now average 44 years old.

Varsity letter winners and non-athletes were questioned concerning their present health, marital status, military record, and economic success. Dr. Massey found few significant differences between athletes and non-athletes in most of these categories. Both groups reported that their health was good and that their economic status was satisfactory.

In the calorie battle, however, the varsity letter winners, who weighed an average of 167 pounds on graduation, had gained an average of 22 pounds since college compared to only 15 pounds for the non-athlete. Dr. Massey emphasized that these data do not necessarily have any medical significance nor do they imply that college sports activity is bad for health later.

Sixty-one percent of the athletes had served in one of the military services compared to 48% of the non-athletes. And 95% of the athletes were married compared to only 91% of the non-athletes.

Science News Letter, March 5, 1955

AGRICULTURE

Atomic Radiation Makes Trees Into Cattle Feed

➤ ATOMIC RADIATION is now capable of making the earth's forests the largest potential source of cattle food in the world.

By subjecting trees to atomic radiation, scientists are now able to transform wood into a digestible livestock feed. Although wood has been converted into feed by chemical processes in the past, the fact that irradiation can do the job may provide the world with a vast emergency storehouse of livestock feed.

There is now enough waste radiation available to make the transformation of wood into feed economically practicable. Heretofore, wood made into feed was not able to compete favorably with natural fodder.

Early in World War II, the Germans first made wood into a livestock feed because they did not have enough natural grains for both humans and livestock. Although the ersatz feed was not the best substitute, it was used effectively. The United States, on the other hand, has never faced the need to use a substitute for natural grains.

Experimentally, scientists have converted wood into molasses for animal feeds for many years now.

By the process of hydrolysis, in which the wood is placed in a slightly acidic bath and percolated, the indigestible lignin fiber has been separated from the cellulose. It is the cellulose which animals are able to convert into starch and then sugar through the action of enzymes.

Humans do not have the same enzymes and cannot convert cellulose from grasses, stalks or wood into the carbohydrates necessary for their food.

Conversion of wood into animal feed by irradiation was made known by Dr. Samuel S. Jones, a scientist at the General Electric Knolls Atomic Power Laboratory, before a meeting of the Society of the Plastics Industry of Canada at London, Ontario.

Dr. Jones was describing the effects of radiation on materials in the vicinity of atomic reactors. He explained that radiation can melt certain rubbers, harden or powder certain types of electrical insulating materials and decompose paint.

Science News Letter, March 5, 1955

NUTRITION

Turns Angel Food Cake Into Bread for Dieters

➤ A GLUTEN-FREE bread, which it is hoped will benefit adult sufferers from sprue and child sufferers of celiac disease, has been developed at the household science faculty of the University of Toronto by Miss Betty Upton, who is also a dietitian at the Toronto General Hospital. She developed the gluten-free bread by starting with an angel food recipe.

Many sufferers of sprue and celiac disease, a digestive illness, cannot digest ordinary bread. Attempts to make a palatable gluten-free bread in the past have failed because the final loaf contained too much baking powder, giving it a chemical taste. Miss Upton arrived at the product by starting with angel food cake and working back toward bread.

Her tasty gluten-free bread contains potato flour, egg white, tetrasodium pyrophosphate, calcium lactate, finely ground bran, cream of tartar, salt and sugar.

One of the big problems, starch without using grain flour, was licked with potato flour. To help the loaf retain its structure, egg white was added. The tetrasodium pyrophosphate, used to give quick puddings their body, gave the recipe body, while calcium lactate, a milk derivative, gave it needed calcium.

To make the bread look and taste like traditional bread, finely ground bran was introduced. The bran was pre-soaked in egg white before being added to the batter to eliminate dryness. The gluten-free bread is tasty, will toast, slice and freeze perfectly.

Development is now being centered on making the bread in commercial-size tins, after which it will be tested by the department of therapeutics of the University of Toronto's Faculty of Medicine, and then will be made available to patients of the Toronto General Hospital.

Science News Letter, March 5, 1955

IN SCIEN

CYTOLOGY

Attack Cancer Cell Nucleus by Enzymes

➤ HITTING THE nucleus of the cancer cell by enzyme chemical treatment has prolonged the mean survival time of laboratory animals with certain cancers by 15% to 183%, Dr. L. Ledoux of Brussels reported in *Nature* (Feb. 5). The finding was made while Dr. Ledoux was working at the Chester Beatty Research Institute of the Royal Cancer Hospital, London.

The enzyme Dr. Ledoux used is ribonuclease which breaks down ribonucleic acid, one of the acids in the cell nucleus. In most of the experiments nucleotides, compounds into which nucleic acid is split by enzyme action, were given with the ribonuclease. This was done because Dr. Ledoux had previously found that the nucleotides were important for action of the enzyme.

The experiments involved 300 animals carrying the Ehrlich or Krebs mouse cancers or the Walker rat cancer. The enzyme treatment was given from two to 13 days after the cancer had been implanted.

Dr. Ledoux called the increase in survival time of the animals "significant." The experiments seem to show, he said, that cell multiplication can "in fact" be modified by changing the level of ribonucleic acid in rapidly growing and reproducing cells.

The enzyme action he reported is, he thinks, similar in principle to the action of another enzyme, xanthine oxidase, on spontaneous breast cancer in mice which Prof. A. Haddow reported to the British Empire Cancer Campaign.

Science News Letter, March 5, 1955

GENERAL SCIENCE

STS Winners Tour Naval Ordnance Lab

See Front Cover

➤ WINNERS OF the Fourteenth Annual Science Talent Search heard an explanation of the Naval Ordnance Laboratory's pressure chamber for testing underwater devices given by Alfred W. Baldwin, an engineer with the Laboratory's technical evaluation department, as shown on the front cover of this week's SCIENCE NEWS LETTER. The young scientists also learned about the place of plastics in ordnance today.

During their five days in the nation's capital, at the Science Talent Institute, the Search finalists visited the National Bureau of Standards, the Army Medical Service Graduate School at Walter Reed Hospital, and the cyclotron at Carnegie Institution's department of terrestial magnetism.

Science News Letter, March 5, 1955

CE FIELDS

SURGERY

Pre-Graft Treatment Improves Surgery

➤ A TREATMENT that may lead to bigger and better spare part surgery for grafting not only skin but whole organs may develop from research by Dr. Nathan Kaliss at Jackson Memorial Laboratory in Bar Harbor, Me.

The difficulty in making grafts "take" and grow in another's body can be overcome, for mice at least, by previous injections of antiserum, he found. The antiserum in the experiments came from the blood of rabbits which had had mouse tissue extracts injected into them.

The experiments were successful for grafting mouse cancers onto mice that ordinarily will not grow such cancers. Grafts of normal tissues to similarly pre-treated mice did not survive. Whether this is due to a basic difference between cancers and normal tissues is not known.

In announcing Dr. Kaliss' findings, the American Cancer Society which supported the work points out that no clinical experiments have been conducted or are contemplated in this center of fundamental research. But the results of this work raise the question of whether skin grafts and organ transplants might be effected between humans by using similar techniques.

Science News Letter, March 5, 1955

METEOROLOGY

Aurora Not a Curtain But Myriads of Rays

➤ DISCOVERY OF what the aurora borealis is made of was announced by Drs. Henry G. Booker, Benjamin Nichols and C. W. Gartlein of Cornell University, Ithaca, N. Y.

The auroral display, which looks like a curtain of shimmering light, is actually composed of hundreds of thousands of relatively tiny rays. The lifetime of each raylet is less than a second.

The rays, columns of ionized air, are continuously forming and fading along the invisible lines of the earth's magnetic field. They measure about 300 feet across and a mile or two in height.

Reflection of radar and radio beams from the northern lights gave the Cornell scientists new information for their theory. To get full use of the signals, the beams must be pointed at right angles to the aurora, the scientists found.

Protons thrown out by the sun and smashing into the earth's outer atmosphere trigger the aurora, Dr. Nichols said, by producing electric fields that give the auroral display.

The northern lights can shift about 300 to 3,000 feet a second. This speed is less than would be expected if proton bombardment were directly responsible for the formation of auroras.

Since the raylets are formed almost instantaneously and decay so rapidly, they look solid when viewed in depth from a distance. When seen overhead, an observer is actually looking at the ends of many ray columns.

The radio and radar observations were compared with photographs analyzed by Dr. Gartlein using high resolution and a spectrophotometer. His work showed that the raylets can be detected in visible light as well as in the radio range.

Best results in studying northern lights by radio are obtained when the display is near the horizon rather than overhead. Kenneth Bowles and Ralph Dyce, Cornell graduate students who spent two summers in Alaska observing auroras there, found this true even in the far North where displays are visible almost every night.

Auroras do odd things to radio waves. They disturb long-distance short-wave communications, but boost the distance that television and other very high frequency waves can be beamed by acting as reflectors.

Science News Letter, March 5, 1955

MEDICINE

Some Ills May Be Caused by Antibodies

➤ "EAGER BEAVER" defense forces in our own body, which damage tissue in the process of combatting foreign substances, may cause rheumatic fever, arthritis, kidney diseases, allergies, RH disease and similar maladies.

This is suggested in studies by Dr. Harrison Latta, associate professor of pathology at the University of California at Los Angeles Medical School. The investigation is being supported by the U. S. Public Health Service.

Dr. Latta is studying the effect of antibodies, which have the job of destroying foreign substances in the body, on individual cells.

Apparently when they attack foreign substances away from walls of tissue cells they perform their mission effectively. But when foreign substances gain a foothold on a cell, complications arise. The antibodies may pursue the "enemy" so vigorously as to damage our own cells.

The damage may be in the form of changing the permeability of cell walls, which may upset the cell's osmotic pressure. This apparently causes a sudden change in cellular components and in cell function. Such a reaction would result in damaged tissue and may explain many maladies.

The study of this mechanism is expected to reveal more about how proteins go in and out of cells. Thus may be gained a better understanding of how viruses, which are large protein molecules, penetrate cells.

Science News Letter, March 5, 1955

NUTRITION

Potato Flakes, Bars And Puffs Are Coming

➤ HOUSEWIVES, GI's, party-goers, restaurant owners and children are all in for a sackful of new potato treats.

Potato users will soon be able to have potato flakes, potato puffs and potato-chip bars. All three new food developments are products of dehydration processes made recently by government scientists.

The potato flakes are dehydrated mashed potatoes. Developed at the U. S. Department of Agriculture's Eastern Regional Research Laboratory, Wyndmoor, Pa., they are described as tasting somewhat like a baked potato after being transformed from flake to mash by simply adding hot water or milk and whipping.

Scientists at the Eastern Laboratory are also responsible for the potato-chip bar developed primarily as a "high-calorie, high-density military ration with taste appeal." The potato-chip bar takes up only one twentieth the space needed for an equivalent amount of ordinary potato chips.

The third new potato treat was developed at the Western Regional Research Laboratory, Albany, Calif., and is a "fat-free, pillow-shaped, puffed potato tidbit that can be flavored and has an attractive crunchy texture and toasted color."

Potato puffs, say the researchers, are good for "out-of-hand" eating, as a breakfast food, and in soups, stuffing and casseroles.

The three dehydrated potato dishes are new developments in the history of drying potatoes for preservation that dates back 2,000 years. They are reoprted in *Agricultural Research* (Feb.).

Science News Letter, March 5, 1955

AGRICULTURE

Mud May be Source Of Agricultural Lime

➤ WASTE MUD that piles up at alumina extracting plants may become a new and economical source of agricultural lime.

The brown mud that is left over when alumina or aluminum oxide is extracted from bauxite ore has been found to contain 47% lime. In recent tests, U. S. Department of Agriculture scientists at the plant industry station, Beltsville, Md., reported that the mud proved comparable to ground limestone and hydrated lime as a corrective for soil acidity.

"Normal liming with brown mud," the government testers stated, "produced no toxic effects on sweet clover plants. Emergence, growth and yield of sweet clover grown in initially acid soil limed with brown mud were excellent and equal to results from regular liming materials."

Alumina extractors, they stated, wind up every year with about 500,000 tons of waste brown mud. The scientists reported their findings in *Agricultural Research* (Feb.).

Science News Letter, March 5, 1955

GENERAL SCIENCE

Need of Scientific Manpower

Soviets, sacrificing all to their ambitions, force U. S. spurt in professional skills to keep us strong. Re-examination of manpower supply underway for defense needs.

By DONALD A. QUARLES

Assistant Secretary of Defense
(Research and Development)

Excerpts from an address at the awards banquet of the Fourteenth Annual Science Talent Search, in Washington, Feb. 28.

➤ LIKE IT or not, we are in a race for technological supremacy with the Communist world and this Science Talent Search has a direct bearing on the outcome of this race. Out of deference to the erudition of those in the audience who have passed the Science Talent Search examination, and by courteous leave of the rest, I will try to develop this thesis in a strictly logical manner.

My first theorem is that within the memory of even the youngest of us, science and technology have revolutionized the art of warfare. I will cite three or four pieces of evidence to show that this is true.

It was apparent before World War II began that airplanes would play a vastly more important role in any future war than ever before. The events of the early months of World War II left no doubt that air supremacy would be decisive. Air supremacy, however, meant much more than just airplanes. In the Battle of Britain, for example, the British attributed the success of their relatively weak interceptor force in stopping the German night bombers to the fact that their recently developed and installed radar network gave them vision in the darkness and thus early enough warning to enable their interceptors to track down and destroy the invading bombers. Thus, military electronics joined aeronautics as a decisive factor in the Battle of Britain.

Electronics Was Decisive

Another instance of the decisive role of electronics was in October 1944 when the Japanese Navy decided to make an all-out attempt to envelop and destroy the U. S. Naval forces in Leyte Gulf. The southernmost of the three Japanese task forces attempted to pass through Suragao Strait under cover of darkness. They were met by U. S. Naval forces which were equipped with precision fire-control radar. The Japanese task force was almost completely annihilated by our radar-directed gunfire in a night engagement that left the Japanese gunners blindfolded.

The ability of radar to see and measure position at night was the decisive factor.

It was toward the end of the war that nucleonics entered as the third decisive element of the new technology. U. S. air power in the far Pacific, including the electronic equipment required to make it effective, had already broken the back of enemy resistance. It was, however, the atomic bombs over Hiroshima and Nagasaki that clinched the victory.

The war ended with general recognition by the experts that the new technology, with nucleonics, aeronautics and electronics in stellar roles, would thenceforth be dominant in any all-out war.

Events in the following decade have confirmed and strengthened this conviction. Both sides have made great efforts to capitalize on the new technology, and to extend and perfect it to maximum military advantage. Great strides have been made. World War II planes would be completely outclassed by the jet planes of today which fly at altitudes and speeds that were only dreamed of a decade ago. Electronics has been pushed ahead so far and its performance so greatly extended that World War II designs now seem crude and ineffective by comparison. And finally, the nuclear sciences have been advanced to the point where explosive forces have to be measured in millions of tons of TNT equivalent rather than tons of World War II blockbusters and the thousands of tons of the Hiroshima and Nagasaki bombs.

Were Too Complacent

As we look back on the period immediately following World War II, we see that we were too complacent in assessing our technical position relative to the Communist world. We knew we had left a lot of equipment of advanced design with the Communists and that the Germans had been the unwilling donors of a lot more.

We knew also that a lot of the German scientists who had worked on the development of new weapons had been persuaded by unspecified methods to move behind the Iron Curtain and continue their work for the Communists. Still we were quite smug about it all. Even when it was learned that some very important secrets had been passed covertly behind the Iron Curtain, we still couldn't believe the Soviets were serious technical competitors.

Many things have since conspired to force us to change our estimate. It will suffice to mention one in each of the three major fields. The Soviet atomic test in the fall of 1949 showed that the Communists had broken our monopoly in this field; their thermonuclear test in August of 1953 left no doubt that rapid progress in nucleonics was being made behind the Iron Curtain.

The large numbers of jet fighters the Communists used in Korea, together with the jet bombers of very advanced design which they flashed in their May Day air show last year in Moscow left no doubt of their progress in aeronautics.

The evidence in electronics, although a bit more obscure, is equally convincing. Perhaps the best single example was afforded by the U.S.S.R. light cruiser Sverdlov when it appeared at the British Coronation ceremonies a year or so ago. Most of the electronic equipment on one of our cruisers of similar class is out of sight but the antennas have to be out where they can see and therefore be seen. Moreover, to the expert, the antenna design tells a lot about the rest of the equipment.

Face Strong Competition

Suffice it to say that the Sverdlov showed up with about the same number and kind of antennas that one would find on the superstructure of one of our own cruisers of similar class. These could have been fakes and the guns could have been made of wood but the time is past when we can derive any comfort from that kind of reasoning. It is clear now that in nucleonics, aeronautics and electronics——in fact, in military technology broadly—we are confronted in this race by a strong competitor. This is my second theorem.

My third deals with the mechanism by which our competitor has made his progress. Technological position is a complicated thing, involving industry, skilled manpower, raw materials and other factors. We know that at least in the first two of these, the Communists were way behind us at the end of World War II. But Communism has always worshipped materialism and the Soviets have always been willing to sacrifice everything else to advance their ambitions for world domination.

Specifically, they have been willing to apply much more of their resources to their heavy industries, which in large measure were war or war-supporting industries, leaving much less to consumer goods than we, in this country, would be willing to accept as a steady diet. In fact, Mr. Malenkov, who placed more emphasis on consumer goods, has just been allowed to listen to a confession of his incompetence and to step aside.

Russian Raw Materials

As regards raw materials, the Communists now dominate a sizable part of the world. On the basis of an austere military-oriented economy, raw materials, with the possible exception of oil, should not pose

too serious a problem for them.

It is perhaps in the scientific and technical manpower area that the Soviets have shown the greatest resourcefulness. Recognizing that material progress is paced by science and technology, they have multiplied by a factor of ten the number of their institutes of higher learning in these fields. Moreover, where less than a third of the students in our universities specialize in engineering and the physical sciences, more than two-thirds of their comparable students specialize in these fields.

Scientists in U.S.S.R.

Numerically, their results are impressive. They are now graduating well-trained scientists and engineers at more than twice the rate we are in this country. If present trends continue, it will be only a matter of a few years before their scientific and technical manpower pool passes the size of our own.

This, of course, is not conclusive—the results depend, too, on how well their professional people are trained and how effectively they are used. Parenthetically, I must make it clear that I believe that the freedoms and incentives of our system give us a big advantage in this regard, and that their pool would have to be considerably larger before it equalled the effectiveness of our own.

Nevertheless, these statistics must give us pause. We certainly can no longer take our superiority in military technology for granted. We must take stock of our own manpower resources and make sure we are developing and using them to our best advantage.

Perhaps at this point we should digress a few moments to consider the principal claimants for scientific and engineering manpower in our modern society and under present conditions of world tension.

Probably the most important claimant for a share of our scientific and technical personnel is our educational system and the basic research activities carried on in our universities and institutes of higher learning. This is the seed corn that must be saved out to insure the next crop of scientists, and also the next crop of scientific discoveries. Nothing could be more shortsighted than to consume our seed corn in our current applied programs, unless, of course, the danger becomes so acute that all else must be sacrificed.

Next, industry is a claimant for a large share of our skilled manpower. Our long-term economic health and military strength depend heavily upon the forward progress of industry; and upon its opening up for our expanding labor forces whole new fields of industrial activity.

There, too, is the requirement for a strong military research and development program to advance military technology and to improve our weapons and our systems of using them. Our present program utilizes directly or indirectly about half of the scientists and engineers available in the country for this kind of work. We could be hopelessly outclassed if we dropped this part of our program.

Finally, the military departments require a certain quota of scientists and engineers to support the very highly technical operations that are being developed and tested for use by our armed forces. Some of this quota of professionally trained people will be in uniform; most will be working in military laboratories, test stations and the like.

Need May Get Worse

Altogether, as the pages of "Engineers Wanted" advertisements in our daily newspapers indicate, there are many more claimants than there are scientists and engineers. Moreover, studies indicate that this imbalance may be expected to get worse rather than better in the years immediately ahead.

There are a number of things happening today that have an important bearing on this problem. The President has sent to the Congress proposed legislation to modify and extend the Selective Service Act and to revamp the National Reserve Plan in order to align these with present day realities. One of the features of the new plan will be to sharpen up our practices in the utilization of scientific and engineering manpower—to see that professional skills are used to best advantage both inside and outside of the armed services.

The objective is not to relieve scientists and engineers of the obligation to serve. They are as conscious of this obligation as any others—perhaps even more so—because their whole training is directed toward service. Nor is the objective to find safer places for them to serve. There just aren't going to be any safe places in the next world conflict, and particularly not in the laboratories and factories where important things are being done. The point here is that in planning and organizing for the utilization of skilled manpower we must put the national interest first.

This means that in spreading equitably the obligation to serve we must use the professional skills where they are most essential to our national security and welfare. This principle applies to doctors and it applies to nuclear physicists, aeronautical scientists and electronics engineers.

Most Precious Resource

My third theorem is then that scientific and technical manpower is our most precious commodity, our real critical resource; that our competitor is being very smart in fostering and conserving his stock of this precious commodity; and that we must sharpen up our own practices all along this line.

This leads me to my fourth and last theorem which is that our system of supply of scientific and technical manpower needs a critical re-examination.

This is a big subject that touches on

Continued on p. 157

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AMPHIBIANS OF ILLINOIS—Paul W. Parmalee —*Illinois State Museum*, 38 p., illus., paper, 25 cents. An aid to the identification and understanding of these coldblooded vertebrates.

ARTHRITIS EXPOSED: For Its Millions of Victims and for Others Who Wish to Prevent It—Millard Tufts—*Olsen*, 61 p., illus., $1.50. A simple explanation of how this painful complaint develops and what you can do to prevent or alleviate it.

THE ATOM SPY HOAX—William A. Reuben—*Action Books*, 504 p., $3.75. Questioning whether any of the persons accused of spying for Russia actually conveyed any atomic secrets.

THE DEVELOPMENT OF COLOR IN BUDGERIGARS —E. W. Brooks—*All-Pets Books*, 48 p., illus., $2.00. For the experimental breeder.

THE DEVELOPMENT OF MODERN SOCIOLOGY: Its Nature and Growth in the United States—Roscoe C. Hinkle Jr., and Gisela J. Hinkle—*Doubleday*, Doubleday Short Studies in Sociology, 75 p., paper, 95 cents. To assist the student in attaining a more integrated understanding of contemporary American sociology.

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FRAGMENTS OF AN ANALYSIS WITH FREUD—Joseph Wortis — *Simon and Schuster*, 208 p., $3.00. The analysis, described here from notes made at the time, was undertaken for professional training, not therapy. It provides an unusual view of the great psychiatrist.

THE HARVEY LECTURES: Delivered Under the Auspices of the Harvey Society of New York 1953-1954 — Claude Fromageot and others — *Academic*, 299 p., illus., $7.50. The Harvey Society is an institution for the diffusion of knowledge of the medical sciences.

INTRODUCING SEASHELLS: A Colorful Guide for the Beginning Collector—R. Tucker Abbott with illustrations by Frederick M. Bayer—*Van Nostrand*, 64 p., illus., paper, $2.50. A beautiful book on a popular hobby.

AN INTRODUCTION TO PLANT TAXONOMY — George H. M. Lawrence — *Macmillan*, 179 p., illus., $3.25. An aid to the amateur botanist and college student of local plants.

LABORATORY EXPLORATIONS IN GENERAL ZOOLOGY—Karl A. Stiles—*Macmillan*, 3d ed., 291 p., illus., paper, $3.75. Designed to help the college freshman in the study of zoological materials and in the development of scientific thinking.

THE MACMILLAN WORLD GAZETEER AND GEOGRAPHICAL DICTIONARY—T. C. Collocott and J. O. Thorne—*Macmillan*, 792 p., $6.95. Here you can look up facts about most of the places in the world and can read about spots you never heard of.

MATHEMATICS IN ACTION — O. G. Sutton — *Crowell*, 226 p., illus., $4.50. Explaining to the layman some of the uses of mathematics in science and practical affairs.

THE MONAGRILLO CULTURE OF PANAMA — Gordon R. Willey and Charles R. McGimsey with an appendix on Archaeological Marine Shells by Robert E. Greengo—*Peabody Museum*, 158 p., illus., paper, $4.65.

MOSQUITOES: Their Bionomics and Relation to Disease—William R. Horsfall—*Ronald*, 723 p., $16.00. Bringing together and summarizing what is known about mosquitoes, their relation to environment, and the part they play in human disease.

MY WAY OF BECOMING A HUNTER—Robert H. Rockwell—*Norton*, 285 p., illus., $3.75. The scientist responsible for most of the habitat groups in the Akeley African Hall of the American Museum of Natural History gives the highlights of his life.

NATIONAL BUREAU OF STANDARDS BIENNIAL REPORT 1953 and 1954—A. V. Astin, Director—*Govt. Printing Office*, Miscellaneous Publication 213, 162 p., paper, 60 cents. Including the Ad Hoc Committee recommendations and describing changes made as a result of them.

NUCLEAR PHYSICS—Alex E. S. Green—*McGraw-Hill*, 535 p., illus., $9.00. A textbook dealing with the characteristics, behavior and internal structure of the atom's nucleus.

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PHYSICAL CHEMISTRY — Scott L. Kittsley — *Barnes & Noble*, College Outline series, 209 p., illus., paper, $1.50. An aid for quick review of the subject. Includes a tabular index to leading standard textbooks.

REPORT OF THE ADVISORY COMMITTEE ON APPLICATION OF MACHINES TO PATENT OFFICE OPERATIONS—V. Bush, Chairman—*Department of Commerce*, 76 p., paper, $1.00. Showing how electronic brains can be used to do much of the tedious work of patent searching.

THEORIES OF PERCEPTION AND THE CONCEPT OF STRUCTURE: A Review and Critical Analysis With an Introduction to a Dynamic-Structural Theory of Behavior—Floyd H. Allport—*Wiley*, 709 p., illus., $8.00. A survey and clarification of the contributions of modern psychologists to the theory of perception.

VARIABLE STARS AND GALACTIC STRUCTURE—Cecilia Payne-Gaposchkin—*University of London (John de Graff)*, 116 p., illus., $3.50. Based on lectures at the University of London by the Phillips Astronomer at Harvard.

Science News Letter. March 5 1955

Solve This PUZZLE? 1 2 3

A common object (found on trains) casts these three shadows: if a candle is held *under* it, its shadow on the ceiling is circular; if a candle is held *south* of it, its shadow on the north wall is square; if a candle is held *east* of it, its shadow on the west wall is triangular. Can you deduce from these facts what the object is? For the answer, see page 149 of Mott-Smith's "MATHEMATICAL PUZZLES FOR BEGINNERS & ENTHUSIASTS" — one of the biggest puzzle book bargains ever offered. 188 easy-to-difficult puzzles based on logic, arithmetic, algebra, plane figures, probability, the analysis of popular board and card games, etc. EXTRA! Valuable tables of prime numbers, squares, and higher powers. Second rev. ed. SEND ONLY $1.00 FOR YOUR BIG 248-PAGE PAPER-BOUND COPY (you save $1.25 off the regular cloth ed.) to Dover Pubns., Dept. 30, 920 Broadway, N. Y. 10, N. Y. Money back in 10 days if not delighted.

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Scientific Manpower

Continued from p. 155

almost all phases of our social and educational system. It is, in the first instance, a personal problem involving the interests and ambitions of our individual young people. It is next a local problem involving the will and ability of the community to provide educational facilities. Beyond this it is a state problem involving state aid to the local schools, and state support of institutions of higher learning.

It gets to be a federal problem, as the President has pointed out in his message to Congress earlier this month [Feb.], where circumstances make it impossible for state and local agencies to handle the problem adequately. As we cannot afford to let such situations go by default, the President's message proposes new legislation that will lend federal assistance, with a minimum of federal interference, in those critical cases most in need of aid.

The proposal would make some $3 billion available for such federal assistance in the years immediately ahead. This, of course, is only one of the ways the federal government is promoting education and research. Others, for example, are research and development contracts, research grants, and special scholarships, which all together support more than half of the research and development in the country today. The new proposal would, however, help to plug an important gap in our present skilled manpower supply system.

Teacher Shortage

In our secondary schools today there is a serious and growing shortage of teachers in mathematics and the physical sciences. The local communities, with the help of local industries can do a lot to make up for this shortage.

My fourth theorem is that it is a matter of national necessity that we strengthen our system of supply for professional-grade scientists and engineers.

These four theorems bring me back to my original thesis — that this Fourteenth Science Talent Search has a direct bearing on national security. I believe the logic is clear. The Science Talent Search is one means, and a very effective one, for stimulating the interest of our young people in professional careers in the physical sciences and the related engineering fields.

I am happy to pay tribute to Westinghouse for the great national service it is rendering through this program. The group of award winners gathered here is excellent testimony to the effectiveness of the program. My sincere congratulations to you on your long head start toward a professional career in scientific fields! One feels your excitement in the air. I have no doubt your future careers will be just as exciting.

Preserve Moral Fiber

In closing I want to correct an impression. I realize that in placing emphasis as I have on technology I have been guilty of a kind of materialism, an implication that material well-being is the highest aspiration of mankind. I do not believe this. We are, however, in a cold war with a ruthless Communism that makes materialism its highest aim and so long as our security is threatened we have to give first priority to the material means of defending and preserving our way of life.

We must also recognize, however, that our success in this competition in the long pull depends on preserving and strengthening our moral and spiritual fiber and on preserving and continually improving our social system so that we may demonstrate to the rest of the world that we do in fact have the best system and that the individual dignity and freedom which we cherish is in fact worth fighting for, and, if necessary, worth dying for.

We in Defense must give first thought to the material means of securing our country and the Free World against aggression. We all hope and pray that this may be achieved without resort to military force.

Again, my congratulations to the contestants; my sincere appreciation to Westinghouse for sponsoring, and to SCIENCE SERVICE for organizing, this Science Search program; and my warm thanks to those who have arranged this wonderful gathering and have permitted me to play a part in it.

Science News Letter, March 5, 1955

The average person in the United States consumes more than three times as much *lettuce* as he did in 1919.

Watering house plants with rain water is suggested if there is sodium in the water system from water softeners.

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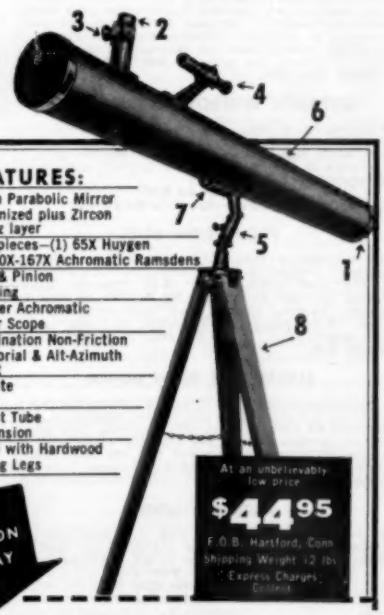

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ELECTRONICS

Debate Double Broadcast

➤ YOU MAY soon be able to hear programs from your local FM station—minus commercials—in buses and commuting trains, while shopping, and on the job.

This is just one of the possibilities of a system being considered by the Federal Communications Commission that would allow FM stations to "multiplex" their broadcasts. In the process, two separate signals would be sent from the same tower using the same radio frequencies. One could be picked up by regular FM sets, the second, by special receivers in public places.

The additional program could be the same or different from the standard broadcast. Commercials could be cut out or others put in their place.

Dozens of FM stations and equipment manufacturers have asked for the right to produce this double broadcast. Other groups, such as the CIO and the American Civil Liberties Union, are protesting the system on the basis that it would violate a citizen's right to quiet and privacy. The FCC commissioners must make the final decision.

The ruling has been pending since Dec. 31, 1953, when the Commission asked interested parties to sumbit their opinions on the advisability of the scheme. The time taken by the Commissioners to decide the question is one indication of the difficulty of the ruling. Less complex proposals are decided in a few months.

The two signals that would come from the same tower are picked up on the same radio dial reading. The additional one, however, would come over at such high frequencies on ordinary sets that it could not be detected by the human ear. Although two simultaneous programs are being broadcast, only the standard signal could be heard on regular FM sets. The special sets include a device that could reject the standard broadcast and only pick up the ultrasonic one.

Multiplexing is only practical on FM broadcasts because at present there are too many technical difficulties in splitting up AM programs. Some engineers believe that if the system is used the quality of the standard broadcast would drop somewhat.

Science News Letter, March 5, 1955

Questions

AGRICULTURE—How can trees be made into cattle feed? p. 152.

□ □ □

BIOLOGY—What is the name of the chemical that causes growth? p. 149.

□ □ □

ELECTRONICS—Why can an ordinary FM set not pick up the added program in the proposed "multiplexing" system? p. 158.

□ □ □

METEOROLOGY—Of what is the aurora borealis made? p. 153.

□ □ □

PSYCHIATRY—What is a music therapist? p. 150.

□ □ □

PUBLIC SAFETY—What are some of the radioactive products of an H-bomb explosion? p. 147.

□ □ □

Photographs: Cover, Fremont Davis; p. 147, Westinghouse Electric Corp.; p. 149, University of Wisconsin; p. 151, Bell Telephone Laboratories; p. 160, Donaldson Co., Inc.

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PORTABLE RINK for outdoor ice skating makes this winter sport possible in some areas from April to November. Installed or dismantled in six days, the portability is achieved by more than eight and one-half miles of plastic piping, providing a network of brine coils over which water is sprayed and frozen to produce a two- to three-inch-thick skating surface.

Science News Letter, March 5, 1955

ELECTRIC STARTER for home power lawnmowers is self-contained. Operating on the same principle as automobile starters, the user only presses a button with his toe and the engine is started. Starting motor operates on 6 volts, 40 amperes, and the 7-plate battery can produce more than 400 starts.

Science News Letter, March 5, 1955

DRAFTING AID uses a time-saving pivot principle to combine a protractor, T-square, rule, paralleler, compass and dividers in one instrument. Made of clear, non-warping plastic, the aid comes in various sizes.

Science News Letter, March 5, 1955

GARDEN SPRAYER is a hollow plastic tube, shown in the photograph, which holds one-half gallon of spray solution. The pressure pump's piston protrudes from the bottom and is pushed down to operate sprayer. Up and down movement supplies pressure capable of shooting streams up to 10 feet from the ground. Sprayer head on a plastic wand has right angle turn to enable operator to spray all parts of plants or shrubs.

Science News Letter, March 5, 1955

DOOR CONTROL utilizes radio-frequency signals to open, by remote control, garages or gates. Designed to be mounted against garage ceiling rafters, the automatic door control is housed in a box 7¼ inches wide by 15 inches long by 9 inches deep. Unit also includes an external light for illumination as door opens.

Science News Letter, March 5, 1955

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Science News Letter, March 5, 1955

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Science News Letter, March 5, 1955

LIGHTING AND transporting devices for photocopying machines permit production of clear, legally acceptable and fadeproof reproductions of documents, papers and cards under any lighting conditions. The new devices, a transparent red plexiglass visor and spring-suspended plexiglass rollers can be installed on any existing machines.

Science News Letter, March 5, 1955

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Do You Know?

The number of *marriages* decreased almost 10% in Reno, Nev., last year as compared with 1953.

There are now 70,000,000 licensed car, bus and truck *drivers* in the United States, one-third of whom are women.

The average *life expectancy* at birth for American workers is now 69.9 years, insurance figures show; in 1911-12 the figure was only 46.6 years.

Supplies can now be dropped to troops from low altitudes by a *"rotochute,"* a bomb-shaped device with rotor blades to slow the descent.

A large part of Texas, including what is now Dallas, Ft. Worth and Paris, was covered by the *Denton Sea* during the period extending from 80,000,000 to almost 60,000,000 years ago.